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AN EXAMINATION OF BARRIERS TO BENEFITS-REALISATION FROM ENTERPRISE SYSTEMS IN THE PUBLIC SERVICE¹

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ABSTRACT

Examination of barriers to benefits-realisation from Enterprise Systems (ES) has potential to provide an innovative perspective on strategic management of large-scale packaged software, and on the extended virtual enterprise explicitly or implicitly deployed across the ES life-cycle. Private sector experience has revealed distinctive conditions applying to ES that create barriers to benefit-realisation. For public service organisations, ES have the potential to enable the provision of end-to-end integrated services, consistent with the demands of public accountability, but are encumbered by a poor track record in large systems implementation and associated process-reengineering. This research analyses the Australian Public Service ES experience, with the aim of dismantling barriers to public sector exploitation of ES. Early results reflect conventional perceptions of implementation issues, but application of the distinctive Dephi-based methodology designed for this study is expected to yield a basis for shared action on the part of government administration, vendors and consultants.

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1. BACKGROUND & STUDY MOTIVATION

Enterprise Resource Planning (ERP) Systems or Enterprise Systems (ES) are now the backbone of many application architectures and are being extended into e-business (Norris, et al 2000; Callaway 2000) and e-government (Gable & Vitale 2000; Terry 2000). Australian government agencies have been widely adopting ES and are encountering challenges similar to those of the private sector - more than 40% of large software projects fail; 90% of ES implementations end up late or over budget; and 67% of enterprise application initiatives could be considered negative or unsuccessful (Davenport 2000). Thus, many organisations clearly underestimate the issues encountered throughout the ES life-cycle.

Large-scale commercial software such as ES is subject to special dynamics (Sumner 2000). The traditional view describes a system life-cycle in terms of development, implementation, and maintenance. In contrast, examination of ES is revealing that their life-cycle involves major iterations (Dailey 1998). Following initial implementation, there are subsequent revisions, re-implementations and upgrades that go beyond what would normally be considered system maintenance. Further, the Australian Public Service has a poor record in IS implementations.

The substantial cost and complexity of ES implementation, and the long implementation period, increase the switching costs of ES reducing the likelihood that organisations will replace ES in the short-to medium-term. They are, therefore, more likely to explore means of generating further value from their existing investment. Markus et al (2000:263) suggest that “ERP benefits are not automatic. They require human and organizational learning, both of which take time and require focused management attention.” Barriers that hinder the realisation of benefits from ES need to be identified and neutralised so as to maximise this organisational resource. In the public sector, agencies seek to increase returns from their ES through its effective use in the provision of services to the public, and by streamlining internal processes. In this era of accountability for public sector outcomes, maximising benefits from resources such as ES becomes paramount to proper public governance.

More specific to this study, the Australian Public Service (APS) has a poor record in large IS implementations, mainly due to organisational politics that preclude appropriate reengineering of organisational and business processes. While ES help avoid the risks associated with development, they confront the public service on a number of points: (1) ES do not sidestep the implementation and integration issues; (2) ES are not tailored to their organisational context but rather require organisational change to fit the technology and technical change - they can challenge public sector departments and agencies when their IS capabilities are weakest; (3) Some leading thinkers in the public sector argue that while the 80-20 rule may be appropriate in the business of making money, in the business of providing services to the public it is often the hardest 20% who are actually the real priority (eg social welfare recipients, applicants for planning permissions, corporate taxation cases etc). ES therefore may not be appropriate to certain areas of public service; (4) The APS has a history of restructuring departments and agencies frequently. Given the size of ES projects, it is imaginable that many projects would not be completed before their organisation is faced with integrating or splitting off organisational units. It is unclear the extent to which ES will facilitate or hinder this process. What is clear is that the issues need to be surfaced and debated.

2. RESEARCH OBJECTIVES

The study aims to increase our knowledge of ES in the public sector. More specifically, the study aims to achieve the following: (1) Identify / explicate major issues in relation to the ES life-cycle in the public sector; (2) Analyse the potential impact of these issues as barriers to ES benefits realization; (3) Canvass these issues over time (e.g. bi-annually) to track, report on, and analyse changes; (4) Highlight areas of consensus and difference among the three stakeholder groups: the user organisation, the ES vendors, and the implementation partners (consultants); (5) Focus discussion and promote con-

structive interaction for developing a sophisticated understanding of the ES life-cycle, and within the public sector in particular; (6) Intensively explore characteristics of, and implications of, ES maintenance management practices that would impact upon an organisation's ability to realize ES benefits; (7) Through survey contacts, gain further access to respondent organisations to conduct rich case studies of their ES experiences; (8) Devise a validated, rigorous, highly prescribed, thus, repeatable research methodology for conducting this style of major issues study; (9) Inform academic research directions in ES; (10) Analyse major issues identified through alternative theory-lenses.

Though primarily focused on the agency and consultant nexus, if software vendors and their implementation partners (consultants) are better attuned to the issues identified, they will be well placed to further support clients throughout the ES life-cycle. This in turn also bears potential benefits for the agency in the form of rationalised and more effective support from the vendor and consultant resulting in improved ability to react to a changing environment, lower costs and an ES that more accurately reflects needs and offers benefits.

3. RESEARCH METHODOLOGY

The study, as shown in Figure 1, is comprised of a PRE-study and the MAIN-study, results of which will be compared.

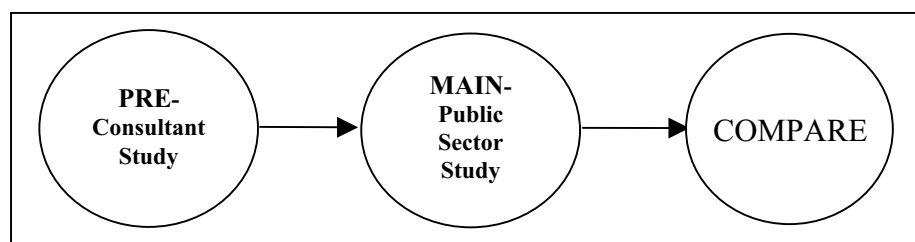


Figure 1. Study structure

The PRE-study inventories ES issues for the public sector generally, from the consultant perspective, without reference to any particular installed ES. Staff from a large consulting firm, who are involved with ES in the Australasian region, are the PRE-study sample. The main question we will be posing to the study sample is “What do you consider have been the major issues in implementing, managing and/or supporting ES in the Public Sector?” In order to gain insight into all issues and their relative importance, the main survey question is intentionally open and broad.

The MAIN-study inventories issues specific to a particular, live ES installation, from the perspectives of all three key players involved in ES life-cycle support; resulting in ‘matched’ public sector, vendor and consultant responses for analysis and reporting.

Working with data collected from the stakeholder groups, the analysis is guided by the following research questions: (1) What are the major public sector ES implementation, management, and support issues faced by the stakeholder groups? (2) What are the relationships between the issues identified? (3) How do stakeholders rate the relative importance of these issues? (4) What are the points of consensus and difference between the stakeholder groups? (5) What recommendations does this study suggest with respect to ES life-cycle implementation, management, and support in the public sector?

Figure 2 depicts the main phases of the study. It should be noted that the phases, from CASE STUDY to INTERPRET AND REPORT, are applied to the consulting firm in the PRE-study, as well as repeated for each government agency, related vendor organisations, and implementation partners in the MAIN-study. The term ‘agency’ in this figure thus refers to any organisation studied: each public sector agency, each consulting firm, and each vendor organisation involved.

The study commences with refinement of the overall study design, confirmation of agency access, and **agreeing the study instruments**, including: case study protocol, multi-round survey instruments, covering e-mails and web-based data collection facilities. Agreement too is sought at this stage on template reports.

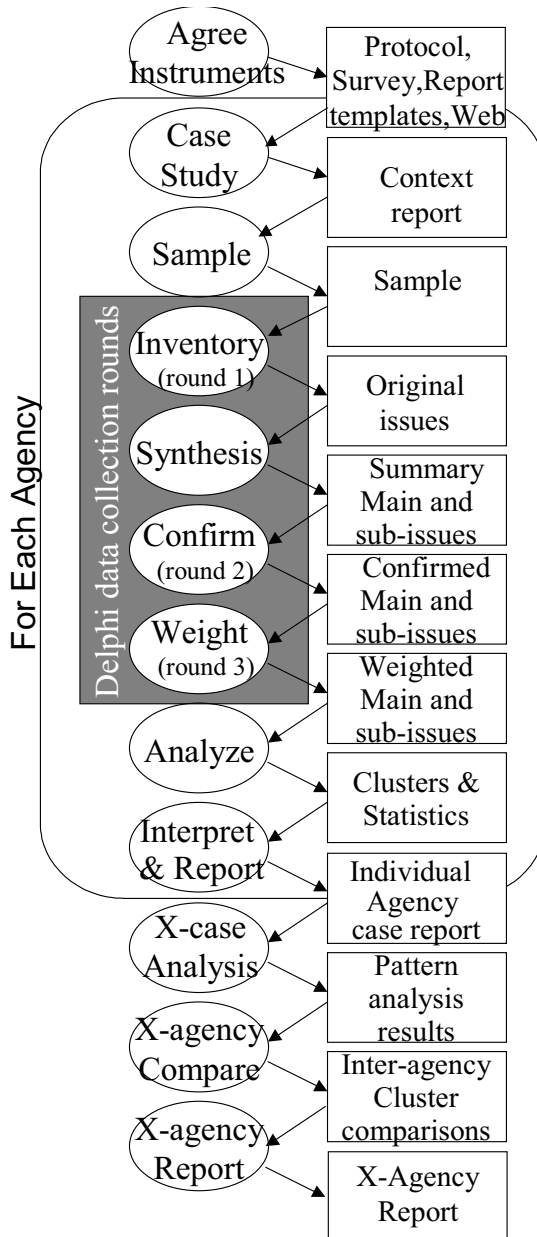


Figure 2. Study phases

where we believe we can make an important methodological contribution, as little guidance is available from the literature on this synthesis process.

In Round two of the survey, our mapping of original issues from each respondent to the summary set is returned to each respondent for **confirmation**, thereby further co-opting respondents to the study, while further validating the summary issues. In the final round three of the survey, respondents are asked to score or **weight** the relative importance of the summary issues. Note that it is possible, following this stage, to extend the survey to further ‘consensus’ rounds whereby average weights on issues are returned to respondents who are allowed to adjust their weights in light of this new informa-

Each agency study commences with a high-level **case study** of the agency and their enterprise system (in the case of the consultant firm in the PRE-study, this would be a broad case study of public sector ES implementation experience), yielding a case narrative and context report. In order to maximise comparability across agencies, instruments and approach will remain as consistent as possible. Next, the starting Delphi study **sample** is defined. We seek to contact only individuals who have substantive experience of ES. We thus first interview our high-level contact in the agency to establish a starting list of ‘knowledgeable’ individuals from all levels of the agency. The round one survey instrument requires that respondents nominate further, target, ‘knowledgeable’ prospect respondents from their agency or from the vendor or consulting organisations (Figure 3). In addition to ‘issues’ we also capture salient demographics thereby allowing us to segment responses for comparison purposes (eg. strategic versus operational staff).

The Delphi-study involves three rounds. Round one seeks to **inventory** issues. The central question posed to the target respondents is “What do you consider have been the major issues in implementing, managing and/or supporting the Enterprise System in [agency name]?” Respondents are also asked for early tentative weights for issues they supply. This process will also identify specific activities by which the key players can capitalise on their advantages and seek to eliminate or overcome obstacles to better manage and support the installed ES. Having gathered a large number of issues, we next seek to **synthesise** a manageable, summary set of master issues (~10) and sub-issues (~30-40). Both top-down (mapping onto existing frameworks) and bottom-up (data-driven) approaches will be attempted and results evaluated and compared. It is in this phase

tion. It is expected that further consensus rounds would prove more valuable with select groups of senior experts rather than the full respondent group.

Weights returned can now be **analysed** to first identify clusters of respondents with differing priorities, and then to compare relative ranks and weights from respondent clusters and across various sample segments based on demographics. This agency-level analysis and the earlier agency-case study will yield an **individual agency report**.

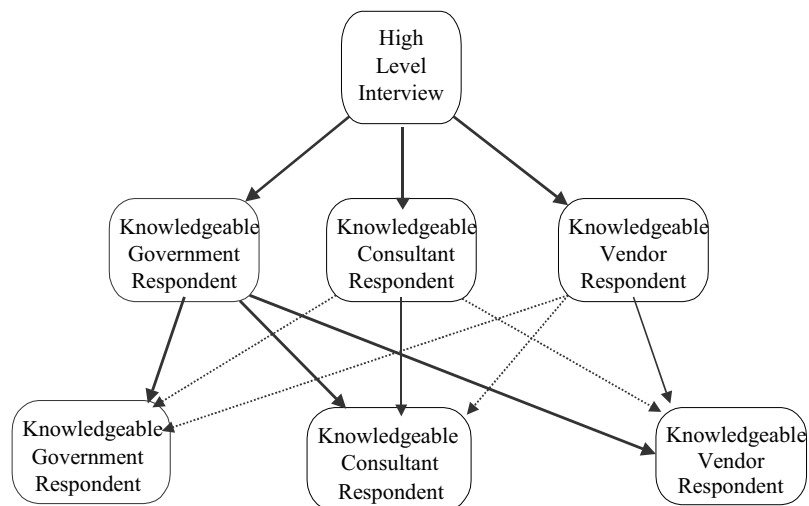


Figure 3. Building the Contact Database (Sample)

Having completed all individual agency studies, cross-case analysis (qualitative) employing **pattern analysis** (Yin 1994) will yield a multiple case study report. Earlier it was possible to do comparative quantitative analyses within the agency data, across clusters identified from the agency data and across demographics. It is now possible to conduct **cross-agency comparisons**, yielding a **cross-agency report**. Particularly interesting and potentially revealing will be comparisons across the public sector, vendor, and consultant responses.

The study design builds upon the team's particular experience with Delphi method (e.g. Chang and Gable 2000a, Chang et al 2000) and with combining case study and survey methods (e.g. Gable 1994). Quantitative data and techniques may be either embedded in the individual cases (Yin 1994) or span the cases and inform cross-case analysis (Gable 1994). Quantitative techniques are used to analyse Delphi weights, thereby pointing to key barriers. Practitioners readily relate to Delphi findings. Qualitative techniques are used to further explore causal relationships between barriers, management interventions, and ES outcomes. Workshops reviewing Delphi findings generate rich interaction and qualitative evidence. Following preliminary case analysis, further quantitative model testing may ensue (Tan et al 2001, is an example of PLS modeling of Major Issues with software maintenance).

The project and approach are innovative in addressing issues perceived at all organizational levels. Though many public sector IS fail because of operational issues, prior Enterprise Systems (ES) research has focused on a single level, almost always strategic. Also, ES are relatively recent. This is the first such study in the public sector and the most extensive and rigorous treatment of ES issues to date in any context. Further, the strong involvement of our consulting firm contacts with ES in the public service in Australia, ideally positions the team to undertake what is believed to be the first such comprehensive treatment of the three perspectives: Agency, Vendor, & Consultant.

The study also seeks to make a methodological contribution through reflective action research into the Delphi survey method. Since the early 80's, IS researchers have used variants of the Delphi Method to identify and rank key issues in the IS field (Table 1).

Though Delphi Method (DM) is popular, design decisions remain unclear, such as who should be surveyed; anonymity; open-ended or structured questions; number of rounds; and how to synthesise a summary list of issues. This *methodological action research* component of the study aims to: (1) Highlight strengths and limitations of DM; (2) Identify important contingencies that should influence DM design or its variation; (3) Propose general improvements to DM; (4) Highlight possible design limitations of past IS key issues studies employing DM; (5) Propose general improvements to future IS Key Issues study designs; (6) Present a complex and detailed example of the application of DM; and (7) Evolve the best possible DM-type design for the ongoing Public Service ES Major Issues study. We have done pilot work in this direction (Chang et al 2000; Chang & Gable 2000a).

Table 1. Delphi-type key IS issues studies

Researchers	Respondents	# of Rnds	Method	Starting Issue Set	Final # Issues	# of Responses	Response Rate
Dickson et al '84	US SIM	4	Ranking	No	19	52, 102, 62, 54	Not reported
Brancheau & Wetherbe '87	US SIM	3	Ranking	Yes	20	90, 54, 68	50%, 62%, 76%
Watson '89	Aus IS Execs	3	10 pt scale	Yes	36	52, 55, 48	26%, 28%, 24%
Niederman et al '91	US SIM	3	10 pt scale	Yes	25	114, 126, 104	47%, 52%, 49%
Pervan '93	Aus IS Mgrs	3	10 pt scale	Yes	27	88, 97, 88	29%, 32%, 29%
Dexter et al '93	Estonian IS professionals	3	10 pt scale	No	30	10, 24, 24	35%, 85%, 85%
Dekleve & Zupancic '96	Slovenian IS managers	4	10 pt scale	No	26	105, 163, 129, 148	32%, 49%, 69%, 80%
Brancheau et al '96	US SIM	3	10 pt scale	Yes	20	78, 87, 83	36%, 40%, 38%

With regards the last listed objective, the study aims to arrive at a highly repeatable and rigorous methodology that can be used to extend the study described herein to other governments and the private sector, as well as overseas. These extensions are expected to yield comparative results of value to the Australian Federal Government, the consulting community and all government agencies studied.

4. THEORETICAL FOUNDATIONS

Early, more exploratory and descriptive work will feed later, more confirmatory work. Questions underlying earlier, more descriptive and comparative analyses include: (1) To what extent are the issues related to ES maintenance? (2) To what extent might the issues impact on the upgrade decision? (3) To what extent do the issues suggest benefits insufficiency? (4) Do the issues suggest areas for increased benefits-realisation? (5) To what extent might issues be a consequence of consultant management? (6) What underlying latent constructs do the issues suggest?

A largely data-driven theory-building approach will be employed during early analysis of first round weights. Cluster analysis may suggest the existence of distinct groups of respondents. Partial Least Squares (PLS) will be used to validate latent constructs with strong explanatory or predictive power. These early analyses (and later analyses of weights for the synthesised main and sub-issues) suggest the following, further research questions: (1) Do sub-groups exist, from amongst the respondents, who have quite different priorities for issues identified? (2) What characterises these sub-groups? (3) Do issues identified suggest the existence of a relatively small number of underlying latent constructs? (4) Can these constructs be usefully associated within a meaningful predictive or explanatory model (based in existing theory or not)?

Hypothesised models and related specific hypotheses will be refined at three main stages of the study: (1) synthesis, (2) interpretation of weights, and (3) cross-case analysis (qualitative pattern mapping). Pilot work by the team, and preliminary work by others in the private sector indicates the following literature as possible theoretical basis for our models and hypotheses: Resource-based Theory of the Firm (Barney 1991); Barriers to Intra-firm Transfer of Best Practice (Szulanski 1995; Szulanski 1996;

Timbrell, Andrews & Gable, 2001); Vertical Integration, Appropriable Rents and the Competitive Contracting Process (Klein et al 1978); and Organisational Virtualness (Davidow & Malone, 1992).

In example, Organisational Virtualness recognises that modern organisations have moved to explicit and implicit models of shared services and have outsourced non-core activities (Davidow & Malone, 1992; Timbrell et al 1998; Bennett & Timbrell 2000). The user-organisation, vendor and service providers are not only isolated stakeholders, but important actors, and ostensibly partners, in a relationship that may span the life of the software. Across the ES life-cycle, clients, consultants, and vendors work together to realise ES benefits in a way suggestive of an extended virtual organisation (Sieber & Griese 1999). Strategic conflict between ‘members’ may arise, threatening ES benefits (Timbrell & Gable 2001). An examination of the barriers to ES benefits-realisation, and identification of relevant theoretical foundations for their explanation, has the potential to provide a unique, innovative perspective on strategic management of large-scale packaged software, and the extended virtual enterprise explicitly or implicitly deployed across the ES life-cycle.

Having only recently gained recognition, the concept of ‘virtual organization’ lacks a universally accepted definition (Mowshowitz 1997). Venkatraman & Henderson (1998) suggest that virtual organizing as a concept focuses on the importance of knowledge and intellect in creating value. Sandhoff (1999) states that virtual organizations overcome traditional forms of decision communication and the classical understanding of rules for inclusion and exclusion of organizations.

The support for the view that maintenance and enhancement of a user-organization’s ES implementation involves the stakeholders in a virtual organization can be found in the series of research on software maintenance by Swanson and his colleagues (Swanson and Beath, 1989; Hirt and Swanson 2001). Based on the case studies of organisations employing mainly in-house custom-built software, Swanson and Beath (1989) originally proposed a relational foundations model for understanding software maintenance issues which consists of three groups of entities: the users, the IS staff, and the application systems. They propose that maintenance problems and issues could be understood in terms of the interrelationships between these entities within each group and between entities from different groups (across the groups). In a recent study of an ES user-organisation, however, Hirt and Swanson (2001) found that the original relational foundations model involving only the entities within the user organisation is not adequate for understanding ES maintenance issues. They proposed that the relational model be extended to also include external entities such as the ES vendor and service providers. That is, to understand issues related to ES maintenance, the maintenance organisation should be expanded to include these external parties. Gable et al (2001) propose that the new relational model is best perceived as a virtual organisation for ES maintenance.

In as much as an organisation’s ES maintenance and enhancement effort is geared towards benefits realizations, we can make several broad research propositions based on the virtual organisation perspective: (1) Key players involved with ES life-cycle support and benefits realization have implicitly entered into an extended, virtual organisation; (2) ES related resources can be better managed across the extended virtual organisation; (3) ES core capabilities must exist somewhere within the extended, virtual organisation; (4) Key players must better understand their respective capabilities in the extended organisation, their respective goals, and how each can aid the other to enable the user organisation to maximise its ES benefits; (5) Not until the key players come together and recognise their place in the larger virtual organisation, will they be in a position to effectively negotiate the incidence of benefits across the membership.

5. CURRENT STATUS OF THE RESEARCH

A study of Queensland Departments of Transport and Main Roads (Niehus et al 1998) identified 9 key issue categories: (1) project championship, (2) parallel support for cash and accrual accounting, (3) accrual output budgeting, (4) unbundling BPR from downsizing, (5) outsourcing facilities management, (6) planning for process redesign, (7) timing/purpose of post-implementation review, (8) BPR

timing and fit with ERP, and (9) skills transfer and staff retention. Both top-down (a priori framework driven) and bottom-up (data driven) approaches to summarising 274 issues identified in a subsequent Delphi study of key issues with ES in five (TheFive) Queensland Government agencies (Chang et al 2000; Chang & Gable 2000b) have identified 10 major issue categories (tentatively ordered here from most important to least): (1) knowledge management, (2) system development, (3) operational deficiencies, (4) organisational context, (5) system performance, (6) cost/benefit, (7) support, (8) data conversion, (9) consultation, and (10) intransigence. This work is currently being extended to all of Queensland Government. Quantitative analysis of weights from TheFive is in progress. Alternative theoretical lenses are being applied to the extension study. Work has also commenced building the federal government contact database (Figure 3) on the replication study. Final results from TheFive and preliminary results from the extension study will be available for presentation at the conference. The study also seeks to make a methodological contribution through reflective action research into the Delphi survey method building on the work of Chang et al (2000) and Chang & Gable (2000a, 2000b).

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